

31 o Faraday's Researches

(fig. 80), and the junction x be heated, the current is there from the silver to the antimony. If silver and bismuth form a thermo series (fig. 81), and the junction x be heated, the current is from the bismuth to the silver; and assuming that heat increases the force of contact (1044), these results will give the direction of contact force between

-----W////////77fa these metals, antimony
 •<— silver, TM and bismuth •—>
 silver. But in the
 voltaic series the
 current is from the
 silver to both the
 antimony and bis-

Fig. 81. muth at their points of contact,

whenever dilute sulphuric or nitric acid, or strong nitric acid, or solution of potassa (1000) are used; so that metallic contact, like that in the thermo circle, can at all events have *very little* to do here. In the yellow sulphuret of potassium the current is from both antimony and bismuth to the silver at their contacts, a result equally inconsistent with the thermo effect as the former. When the colourless hydro-sulphuret of potassium is used to complete the voltaic circle, the current is from bismuth to silver, and from silver to antimony at their points of contact; whilst, with strong muriatic acid, precisely the reverse direction occurs, for it is from silver to bismuth, and from antimony to silver at the junctions.

1047. Again;—by the heat series copper gives a current to gold; tin and lead give currents to copper, rhodium, or gold; zinc gives one to antimony, or iron, or even plumbago; and bismuth gives one to nickel, cobalt, mercury, silver, palladium, gold, platinum., rhodium, and plumbago; at the point of contact between the metals:—currents which are just the reverse of those produced by the same metals, when formed into voltaic circuits and excited by the ordinary acid solutions (1000).

1048. These, and a great number of other discrepancies, appear by a comparison, according to theory, of thermo contact and voltaic contact action, which can only be accounted for by assuming a specific effect of the contact of water, acids, alkalies, sulphurets, and other exciting electrolytes, for each metal; this assumed contact force being not only unlike thermo-

metallic contact, in not possessing a balanced state in the complete circuit at uniform temperatures, but also having no relation to it as to the *order* of the metals employed. So bismuth and antimony, which are far apart in thermo-electric order, must have this extra character of acid contact very greatly developed in an opposite direction as to its result, to